SYNTHESIS OF ULTRADISPERSE CDO POWDERS IN A PLASMA-SOLUTION SYSTEM

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Abstract: Ultrafine powders of cadmium oxide were obtained from the plasma-solution system. The powders obtained were examined with SEM, XRF, and TGA.

CdO are widely used in electronics and it has prospects in the future. One of the promising methods of obtaining this substance is plasma-solution synthesis.

A method for the synthesis of CdO powders using a plasma-solution system is proposed. Aqueous solutions of $Cd(NO_3)_2 \cdot 4H_2O$ with a concentration of 0.05 mol/l, a volume of 200ml were placed in an H-shaped glass cell. The voltage on the titanium electrodes located above the solution was sufficient to ignite the discharge. The discharge current was 40 mA, the discharge burning time was 10min. At the action of a discharge in the anode part of the cell a suspension (hereinafter precursor A) is formed and precipitation of deposite (precursor B). The synthesized powder was taken separately from the bottom and from the near-surface layer, centrifuged and dried at a temperature of 60°C for 24 hours.

X-ray was carried out using a DRON 3M X-ray diffractometer (CuKα radiation). On the basis of these data the quantitative phase composition of the powders were determinated. Thermogravimetric (TGA) analysis and scanning differential calorimetry were used to study samples. Analyzes were performed on a STA 449 F1 Jupiter (Netzsch, Germany) instrument in the temperature range of (30-600)^oC at a heating rate of 5^oC/min. The surface images of the powders and their EDX were obtained with a SEM Tescan VEGA3.

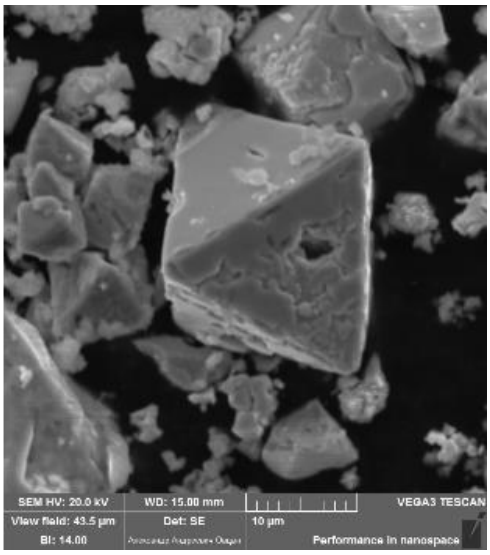

Fig. 1. Images of SEM CdO (precursor-A after calcination).

X-ray showed the presence of a large number of reflexes indicating the crystallinity of synthesized substances. The composition of precursor A and B is different. The composition of A is: $Cd(OH)(NO_3) \cdot H_2O$ – 38.2%, $Cd(OH)_2$ – 50%, $Cd_3(OH)_5(NO_3)$ – 11.8%. The composition of B is: $Cd(OH)(NO_3)$ H_2O – 34.2%, $Cd(OH)_2 \cdot H_2O$ – 53.5%, $Cd_3(OH)_5(NO_3)$ – 12.3%. The TGA and DTG confirm that A and B differ in composition. DTG after calcination demonstrates the absence of extremums, that is, we are dealing with a stable anhydrous compound. Annealing A and B at 500°C for 2 hours leads to the formation of CdO powders. In the Images of the powders obtained after calcination, crystal structures of CdO are clearly visible (Fig. 1).

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